

Claims:

1. A method, in printing an image, of compensating for one or more defective printer nozzles in a plurality of printer nozzles, said method comprising the steps of:

biasing, for each first image value associated with a first nozzle, at least one second image value associated with another nozzle, said biasing being dependent upon said first image value and a term for said first nozzle; and

printing the image in accordance with the biased image values, said biasing reducing print artefacts otherwise caused by the one or more defective nozzles.

2. A method according to claim 1, whereby the term for said first nozzle provides a measure of one of effectiveness and defectiveness of said first nozzle.

3. A method according to claim 1, whereby said biasing comprises the sub-step of:

redistributing one of part of said first image value and all of said first image value to one or more image values associated with immediately neighbouring nozzles of a same colour.

4. A method according to claim 3, whereby an extent of image value redistribution is dependent upon an allowed operating range of the one or more image values associated with said immediately neighbouring nozzles.

5. A method according to claim 4, whereby said allowed operating range of said image values is between 0% and 100%, wherein 100% represents a maximum intensity for unbiased image values.

6. A method according to claim 4, whereby said allowed operating range of said image values is between 0% and 200%, wherein 100% represents a maximum intensity for unbiased image values, and 200% represents a super-intensity for biased image values.

7. A method according to claim 1, whereby said biasing comprises the sub-steps of:

increasing an image value associated with a corresponding nozzle of another colour.

8. A method according to claim 1, whereby said biasing comprises the sub-steps of:

redistributing one of part of said first image value and all of said first image value associated with said first nozzle to one or more image values associated with immediately neighbouring nozzles of a same colour; and

increasing an image value associated with a corresponding nozzle of another colour, said increase being dependent upon a residual image value of said first nozzle after said redistribution step.

9. A method according to claim 6 comprising, prior to printing the image, the sub-step of:

mapping the biased image values from a biased image value range of 0% to 200%, to a range of 0% to 100%.

10. A method according to claim 9, whereby said mapping uses checkerboard quantisation, said method comprising the steps of:

dividing said biased image values by 2; and

alternately rounding successive divided image values up, and down.

11. A method according to claim 6, comprising, prior to printing the image,
the sub-step of:

halftoning the biased image values.

5 12. A method according to claim 11, whereby, in a multi-level halftoning
process, a relationship between an input image value and a corresponding average
halftone output value is adjusted in order to tune a utilisation of super-intensity printing.

13. A method of printing a multi-level halftoned image comprising the steps
10 of:

adjusting a relationship between input image values and corresponding average
halftone output values using an error diffusion table.

14. An image recording apparatus comprising:

15 (a) a plurality of forming elements for forming an image according to input
image forming signals;

(b) memory means for storing data for said forming elements indicating the
relative desirability of utilising said forming elements for forming an image;

20 (c) image processing means for computing image recording signals using
said input image forming signals and said data stored in said memory means where the
use of a forming element is biased using the relative desirability data of other forming
elements.

15. An image recording apparatus comprising:

25 (a) a plurality of forming elements for forming an image using image
recording signals, said image according with a corresponding plurality of input image
forming signals;

(b) memory means for storing data for said forming elements indicating the
relative desirability of utilising said forming elements for forming the image; and

(c) image processing means for computing said image recording signals using said input image forming signals and said data stored in said memory means, wherein the use of a particular forming element is thereby biased dependent upon the relative desirability data of other forming elements, the corresponding input image forming signal for the particular forming element, and a term for the particular forming element.

16. An image recording apparatus comprising:

(a) a plurality of forming elements for forming an image according to input image forming signals;

(b) memory means for storing data for said forming elements indicating the relative desirability of utilising said forming elements for forming an image;

(c) image signal modification means for redistributing values of said input image forming signal based on said data stored in said memory means so as to bias the use of said forming elements.

17. An image recording apparatus comprising:

(a) a plurality of forming elements for forming an image according to input image forming signals;

(b) memory means for storing data for said forming elements indicating the relative desirability of utilising said forming elements for forming an image;

(c) image signal modification means for redistributing values of said input image forming signals based on said data stored in said memory means so as to bias the use of said forming elements, wherein the use of a particular one of said forming elements is thereby biased dependent upon the relative desirability data of other forming elements, a corresponding input image forming signal for the particular forming element, and a term for the particular forming element.

18. An image recording apparatus according to claim 16 where:

said image signal modification means for redistributing values of said input image forming signals does not extend the range of said values.

19. An image recording apparatus according to claim 14 where:

5 said apparatus is a colour image recording apparatus, said plurality of forming elements including plural groups of forming elements respectively corresponding to colour components.

20. An image recording apparatus according to claim 19 where:

10 said image processing means includes means for modifying the input image forming signals relating to a colour component based on said input image forming signals and based on said data indicating the relative desirability of utilising said forming elements relating to other colour components.

15 21. An image recording apparatus according to claim 16 where:

 said apparatus is a colour image recording apparatus, said plurality of forming elements including plural groups of forming elements respectively corresponding to colour components.

20 22. An image recording apparatus according to claim 21 further comprising:

 image processing means for modifying said redistributed input image forming signals relating to a colour component based on said redistributed input image forming signals and based on said data indicating the relative desirability of utilising said forming elements relating to other colour components.

25 23. An image recording apparatus according to claim 16 where:

 said forming elements are capable of recording a "super" density being greater than any density recorded by said forming elements when no image forming signal values are redistributed by said image signal modification means; and

said image signal modification means is capable of biasing the use of said forming elements to record said super density.

24. An image recording apparatus according to claim 23 where:
5 redistribution of values of said input image forming signals is capable of extending the range of said values.

25. An image recording apparatus according to claim 24 further comprising:
image processing means for re-mapping said redistributed image forming signals
10 so that the range of said values is restored to the range existing prior to said redistribution.

26. An image recording apparatus according to claim 24 where:
said image processing means map redistributed image forming signals to the
range existing prior to said redistribution by maintaining distinct local average image
15 values for image regions with differing constant input image signal value.

27. An image recording apparatus according to claim 26 where:
said image processing means map redistributed image forming signals to the
range existing prior to said redistribution by substantially dividing image values by 2 and
20 alternately rounding up and rounding down.

28. An image recording apparatus according to any of claims 24 to 27
further comprising:
half-toning means which generate recording element signals so that the frequency
25 of occurrence of super density recording by recording elements is adjusted according to half-toning parameters.

29. An image recording apparatus according to claim 28 where:

said halftoning means generate recording element signals by error diffusion processing such that the frequency of occurrence of super density recording by recording elements is adjusted according to values in an error diffusion table.

5 30. An image recording apparatus according to claims 14 to 29 further comprising:

image signal forcing means whereby image signals corresponding to selected forming elements are set to prevent recording; said selected forming elements being determined by said data indicating the relative desirability of utilising forming elements.

10 31. An image recording apparatus according to claims 16 to 30 further comprising:

(a) memory means for said forming elements based on non-uniformity of the density of a recorded test image; and

15 (b) correction means for correcting said redistributed input image forming signals based on said data stored in said memory means.

20 32. An image recording apparatus according to claims 14 to 31 wherein:
each of said forming elements is a forming element for ejecting a liquid drop by film-boiling due to head energy.